UNIT 2

The Cognitive Approach

2.1 Cognitive Psychology

The **cognitive approach** is all about how we take in information from our world, organise it, and use it to help us function successfully. It is conerned with the interal operation of the mind, and seeks to understand the role of mental processes in determining human behaviour. Psychologists argue that cognition involves everything human beings do.

There are five *key terms* to the approach:

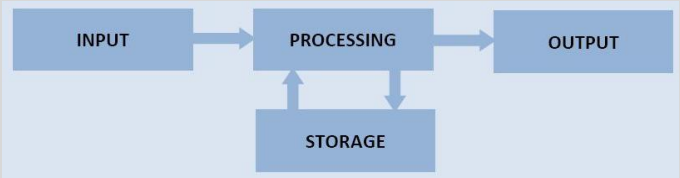
- **information processing**: involves the input, manipulation and output of information
- **memory**: the ability to retain and reproduce mental impressions; it involves encoding, storing and retrieving information
- **forgetting**: losing of putting information away from the memory
- **storing**: the way in which information is retained within the brain after it has been registered
- **retrieving**: the act of locating and extracting stored information from the brain

There are two key assumptions to the cognitive approach; the first one is **information processing** (above). The focus of the approach is on *information processing* and how this might affect behaviour. The flow of information is described as:

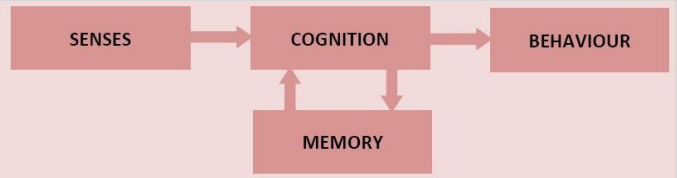
INPUT → PROCESS → OUTPUT

2.2 The Computer Analogy

The second key assumption is the **computer analogy**, which assumes the brain functions similarly to a computer.



The flow of information for a computer



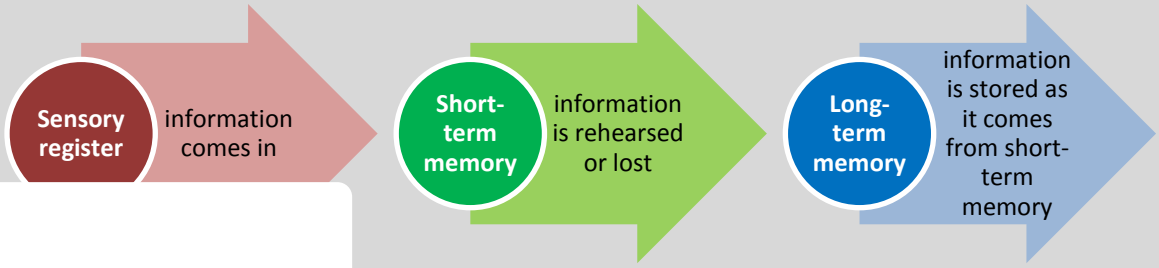
The flow of information in the human brain

However, there are some limitations to the assumption. There are a number of ways in which our brains differ from a PC:

Computer	Human brain
A computer receives all input	The brain only pays attention to a very small amount of information input
A computer cannot lose information (unless data becomes corrupt or there is damaged loss of data)	The brain can easily misplace information and experience difficulty recalling information
You can choose to delete certain information from a computer permanently	You cannot push something unpleasant deliberately from your mind
A computer is emotionless	Emotions have a strong impact on the way our minds function
A computer only knows as much as the information which has been input	The brain can try to piece together memories and fill in the gaps

2.3 The Multi-Store Model of Memory

The **multi-store model** is based upon the linear idea of *information processing*. Its researchers, **Atkinson and Shiffrin (1968)** chose to investigate capacity of storage, duration of the storage, and the representation method.



Sensory register: this can last up to around 2 seconds. Information is taken in by our senses. If the information is not attended to, it will be permanently lost

Short-term memory: (e.g. looking up a phone number and remembering it for the short time it takes to dial it) this lasts only temporarily, and it is common to **rehearse** the information. For example, if you are looking up a phone number, you will say to yourself "01294…" to yourself several times as you walk to the phone to dial it. This type of memory is mainly auditory and has a limited capacity

Long-term memory: this can last for years and supposedly has an unlimited storage timeframe. It is mainly encoded in terms of *meaning* (**semantically-encoded memory**).

- ✓ There have been many lab experiments which support the model, such as Glanzer and Cunitz (see right) because the primacy and recency effects are explained by it
- ✓ Case studies, such as that of Clive Wearing, who noted an area of the brain (the hippocampus) which, when damaged, prevents new memories from being laid down – this provides physiological support
- × Even though case studies like Clive Wearing have suggested an area of the brain for short-term memory, another case study (Shallice and Warrington, 1970) showed that a victim of a motorbike accident was able to add long-term memories even though his short-term was damaged. This goes against the multi-store model
- × The experiments that give evidence for the model use artificial tasks, which means that the results might not be valid

2.4 Levels of Processing Framework

This model was put forward by **Craik and Lockhart (1972)** as an improvement on the multi-store model. They suggested that memory actually depended on the *depth* of processing, not being in different stores. Their **levels of processing framework** suggests that information is more readily transferred into the long-term memory (LTM) is it is processed **semantically** (deep processing, involving considering, understanding and relating to past memories to gain meaning). If it is merely repeated, they said it is less likely to go into the LTM. Craik and Lockhart suggested three levels of processing:

- **shallow processing** when remembering words, this involves *structural processing*, looking at what they look like
- **intermediate processing** this is **phonemic** (or **phonetic**) processing – looking at the sound of the word
- **deep processing** this is *semantic* processing (considering the meaning of the word)

The table below outlines a summary of their framework:

Feature	Explanation
Memory trace	Comes with depth of processing or degree of elaboration: no depth of processing means no memory trace
Deeper analysis	Leaves a more persistent memory trace
Rehearsal in primary memory	Holds information but leaves no memory trace
When attention is diverted	Information is lost at a rate that depends on the level of analysis

- ✓ There is much evidence for the framework, including many studies (see that of Craik and Tulving below)
- ✓ It links research into memory with research into perceptic and selective attention; it focuses on information processing and the whole process; this means it is a stronger explanation than the multi-store model, because more studies can be explained by it
- × It is unclear whether it is really the depth of processing which affects the strength of the memory trace: it may be time spent processing, since deeper processing also involves spending more time processing
- × There may be more effort involved in deeper processing, which means that the greater effort may be what produces better recall (better memory)

2.5 Craik and Tulving (1975) KEY STUDY

Aim: To test the levels of processing framework by looking at trace durability

The levels of processing framework suggests that material which has been processed deeply (semantically) will be recalled the best. Craik and Tulving tested this in 1975 by looking at trace **durability** (how long the trace lasts) and how it is affected by the depth of processing. When the memory trace has gone, **forgetting** occurs. The study used participants remembering material which had been processed at each of the different levels to see how it affected their recall performance

PROCEDURE

1. The participants were put into situations where they used different depths of processing:
   - **shallow processing** involved asking questions about the words themselves (**structural processing**)
   - **intermediate processing** involved questions about rhyming words (**phonemic processing**)
   - **deep processing** involved whether a word fit into a particular semantic category (**semantic processing**)
2. All ten experiments used the same basic procedure. Participants were tested individually, and were told that the experiments were about perception and reaction time. A **tachistoscope** was used, which flashed words onto a screen
3. Different words were shown, one at a time, for 0.2 seconds. Before the word was shown, participants were asked a question about the word, which would lead to different levels of processing, from the list above
4. They give a "yes" response with one hand and a "no" response with the other
   The questions were designed to have half of them answered "yes" and half "no"
5. After all the words have been completed, the participants had an unexpected recognition assessment

In *Experiment 1*, structural, phonemic and semantic processing was measured, as well as whether or not a particular word was present. Words were presented at 2-second intervals over the tachistoscope. There were 40 words and 10 conditions. Five questions were asked: Do the words rhyme? Is the word in capitals? Does the word fit into this category? Does the word fit into this sentence? Is there a word present or not? Each question had "yes" and "no" responses, making ten conditions overall

FINDINGS and CONCLUSIONS

Response Type	**Level of Processing from Least Deep (1) to Deepest (5)**				
	1 Is there a word?	2 Is the word in capitals?	3 Does the word rhyme?	4 Does the word fit into this category?	5 Does the word fit into this sentence?
	Proportion of words recognised correctly				
Yes	0.22	0.18	0.78	0.93	0.96
No	N/A	0.14	0.36	0.63	0.83

Deeper encoding (when the participants had to consider whether a word fitted into a particular category or sentence) took longer and gave higher levels of performance. Questions where the response was "Yes" also produced higher recall rates than those which were responded with "No". It is interesting that "Yes" and "No" answers took the same amount of processing time, but "Yes" answers led to better recognition rates

It was concluded that the enhanced performance was because of qualitatively different processing, not just because of extra time studying. Craik and Tulving say "manipulation of levels of processing at the time of input is an extremely powerful determinant of retention of word events"

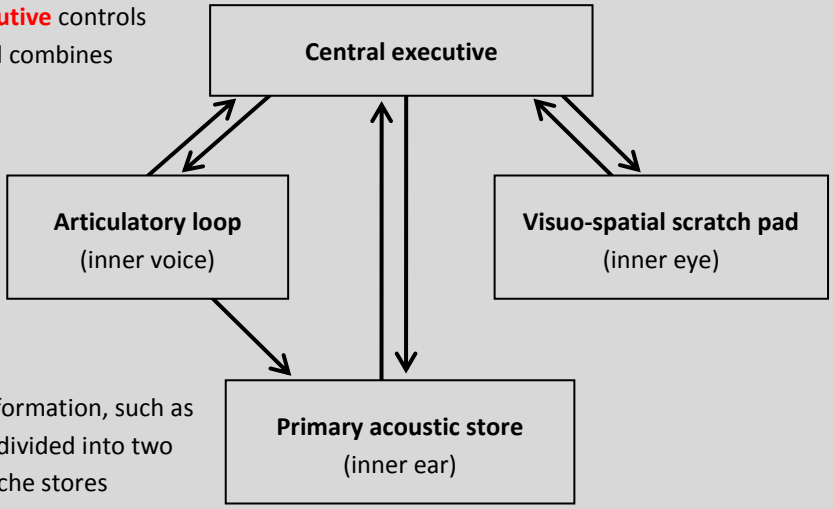
EVALUATION

- ✓ The experiments were designed carefully with clear controls and operationalisation of variables. The study can therefore be replicated and the findings are likely to be reliable
- ✓ The framework is clear and the study takes the ideas and tests them directly, subsequently feeding back to the framework
- × One weakness is how to test "depth" – it can be very vague – it could be effort or time spent processing which affected the recall performance
- × The tasks are artificial. They involve processing words in artificial ways and then trying to recognise them. This is not something that would be done in real life, so the study could be said to lack validity

2.6 Working Memory Model

Baddeley and Hitch (1974) used the **multi-store model** of memory as the basis for the **working memory model**. They were dissatisfied with the multi-store model, but used the idea of the short-term memory and long-term store. This model is an improvement on the short-term memory of the multi-store model

The original model is shown here. The **central executive** controls the other components of the working memory, and combines information from those sources into one **episode**



The **phonological loop** consists of the **articulatory loop** (or inner voice) and the **primary acoustic store** (or inner ear). The inner ear receives auditory memory traces which decay very rapidly. The inner voice revives these traces by rehearsing them

The **visuospatial scratchpad** manipulates spatial information, such as shapes, colours and the positioning of objects. It is divided into two parts: the **visual cache** and the **inner scribe**. The cache stores information about form and colour, and the scribe deals with spatial information and movement, and also rehearses the information held in the scratchpad to be transferred to the executive

The reason the model highlights the phonological loop and visuospatial scratchpad being two separate elements is because it is difficult to perform two similar tasks simultaneously successfully. For example, you cannot perform two visual tasks together well, nor two auditory, but you can do one visual and one auditory together

Further evidence supports the idea of the two systems being separated, for example, patients with **agnosia**. This causes a loss of the ability to recognise objects (the *visual cache*), persons, sounds, shapes and even smells. This is often associated with brain injury or neurological illness. Sufferers will be unable to recognise an object they are presented with, but can still copy a drawing of that object (for example, if presented with a toy car, they cannot name it as a "car" but can look at it and draw it). This proves that the spatial component remains there and intact

De Groot (2006) looked at expert chess players, who were no better at recalling where chess pieces had been randomly placed on the chess board than non-players. However, when the pieces were placed in their correct positions, the chess players had a (predictably) outstanding memory of where they should be. This supports the idea of the long-term store being used to help interpret information in the working memory (short-term).

- ✓ The model is an *expansion* on the multi-store model, it shows why some dual tasks are different, and why you cannot undertake two different visual or verbal tasks simultaneously successfully
- ✓ There is much research supporting the model, including psychological lab experiments and neurophysiological research, such as brain scans showing the differences in brain activity
- ✓ Patients with agnosia support the model's separation of visuospatial components
- × Because the episodic buffer was added 26 years after the original model was published, it suggests that the original model was incomplete, therefore the model may not serve a an explanation of the working memory
- × The model doesn't account for all senses (it only relies on sound and sight), and much of the lab support for the model uses artificial tasks which lack validity: because the tasks are not true-to-life, you cannot guarantee that the other senses might have been used in real life

2.7 Reconstructive Memory

The key idea which Bartlett proposed this theory upon was that *memory is not like a tape recorder*. Bartlett, and many other psychologists, have suggested that a memory is not perfectly formed, perfectly encoded and perfectly retrieved

Bartlett started by thinking that past and current experiences of the individual reflect how an event is remembered. He notes that there would be **input**, which is the **perception** of the event. This is followed by the **processing**, which includes the *perception and* **interpretation** of the event; this involves previous experiences and **schemata** (ideas or scripts about the world, for example an "attending a lesson" or "going to the cinema" script, which paint a certain expectation of the event and outline rules of what to do)

War of the Ghosts

The origins of Bartlett's theory came from a game of Chinese whispers. He decided to construct his own experiment, which was based a Native American folk story called *War of the Ghosts*. He used such a story

because it was very unfamiliar to them, being in a different style and from a different culture, therefore not slotting into their usual schemata. First of all, Bartlett would read the participants the story, and then ask them to repeat the story back to him, which prompted several different accounts. There were several more occasions where Bartlett met with the participants to hear what they could remember of the folk tale. They were able to recall less and less each time as time went on, so the story became shorter. However, it tended to make more sense, compared to the original story, which to them made no sense whatsoever

After about six recall sessions, the participants' average stories had shortened from 330 words to 180 words. Bartlett noticed that people had **rationalised** the story in parts that made no sense to them, and filled in their memories so that what they were recalling seemed sensible to them

Rationalisation: altering something so it makes sense to you
Confabulation: making up certain parts to fill in a memory so it makes sense

- ✓ The theory is backed by much support, including Bartlett's *War of the Ghosts* Chinese whisper-style experiment, as well as the work of Elizabeth Loftus, who has studied the unreliability of eyewitness testimonies
- ✓ It can be tested by experimental method because the independent variable can be operationalised and measured: a story can have features that can be counted each time it is recalled and the changes recorded, so up to a point, the theory can be scientifically tested
- ✗ The study used *War of the Ghosts,* which made no sense to the participants, therefore it might be argued that they altered the story to make it make sense because they were being asked to retell the story
- ✗ There could have also been demand characteristics for the study, where the participants anticipate what is the indented answer and try to give that: this would make the findings unreliable
- ✗ It does not explain *how* memory is reconstructive: this is a theory of description, not an explanation

2.8 Cue-Dependent Theory of Forgetting

Tulving (1975) proposed this theory of forgetting for the long-term memory. He suggests that memory is dependent upon there being the right cues available. Forgetting occurs when they are not. Two materials are required for recall: a **memory trace** (information stored as a result of the original perception of the event), and a **retrieval cue** (information present in the individual's **cognitive environment** at the time of retrieval that matches the environment at the time of recall)

Everyone has experienced the **Tip of the Tongue Phenomenon** (proposed by Brown and McNeill, 1966). This refers to knowing a memory exists, but not having the right cues to access it. This is an example of cue-dependent forgetting

Retrieval cues have been separated into two groups: **context cues** (the situation or context) and **state cues** (the individual's state or mood at the time). Below is an example of a study exemplary of each

Baker et al. (2004)

This study looked at whether chewing gum when learning and recalling material produces a similar context effect. 83 students aged 18-46 took part, being randomly assigned to one of four conditions. In all conditions they were given two minutes to learn fifteen words. They were asked to recall the words immediately and 24 hours later. The conditions were:

- *gum-gum* (chew gum when learning and recalling)
- *gum-no gum* (chew gum when learning but not recalling)
- *no gum-gum* (don't chew gum learning, do when recalling)
- *no gum-no gum* (don't chew gum when learning or recalling)

In both conditions where the gum was present or absent at both learning and recall, more words were recalled than when the gum was present at only learning or recall. This suggests that chewing gum when learning and recalling information significantly aids memory due to context-dependency effects

Lang et al. (2001)

This investigated the role of emotion as a state cue by inducing fear. 54 students who were fearful of snakes and spiders had their fear induced again whilst learning a list of words. They found that when the fear was induced for recall, the scared students were able to recall more learnt words than when they were in a relaxed state. Experimental research seems to support anecdotal evidence that places, objects, smells and emotions can all be triggers to aid recall, but without these cues present we are liable to experience difficulty remembering

The theory is supported by much **anecdotal evidence** (personal experiences – most people have experienced the "Tip of the Tongue Phenomenon" where you cannot quite recall what you know exists). There is also a great deal of **experimental evidence** (provided by studies) which support the theory. A further strength is that the theory has practical applications, which are related to cognition and improving memory and ability to recall information. Also, the theory can be tested, unlike theories such as **trace-decay theory**

However, one major weakness is that the tasks from all studies supporting the theory are artificial: most often learning words lists. Also, it is only an explanation for forgetting from long-term memory, it does not include anything about the short-term store. The theory may not be a complete explanation either, as it cannot explain why emotionally-charged memories can be really vivid – even without a cue (such as **posttraumatic stress disorder** or **PTSD**). It is also hard to prove whether a memory has been revived from the cue or from the memory trace simply being activated, therefore it makes the theory hard to refute

2.9 Godden and Baddeley (1975) — KEY STUDY

Aim: To investigate cue-dependency theory using divers in wet and dry recall conditions

PROCEDURE

Divers were asked to learn words both on land and underwater. The words were then recalled both on land (dry) and underwater (wet). This made four conditions: "dry" learning and "dry" recall; "dry" learning and "wet" recall; "wet" learning and "dry" recall and "wet" learning and "wet" recall

There were 18 divers from a diving club, and the lists had 36 unrelated words of two or three syllables chosen at random from a word book. The word lists were recorded on tape. There was equipment to play the word lists under the water. There was also a practice session to teach the divers how to breathe properly with good timing, so as not to cloud their hearing of the words being read out. Each list was read twice, the second time was followed by fifteen numbers which had to be written down by the divers to remove the words from their short-term memory. Each diver did all four conditions. There was 24 hours in between each condition. When on land, the divers had to still wear their diving gear

FINDINGS and CONCLUSIONS

As predicted, words learned underwater were best recalled underwater, and words learned best on land were best recalled on land. The results are shown in the table below, the figures are the mean number of words remembered in each condition:

		Recall environment	
		Dry	Wet
Study environment	Dry	13.5	8.6
	Wet	8.5	11.4

The mean numbers of words remembered for conditions with the same environment for learning and recall (13.5 out of 36 for dry/dry and 11.4 for wet/wet) were much higher than those with dissimilar locations

EVALUATION

- ✓ There were strong controls present, which makes the study replicable, so its findings are likely to be reliable
- ✓ Even though the tasks were artificial, all of the participants were divers who had experience performing tasks under the water, and so the environment they were in was not unfamiliar – this means that there was a limited presence of ecological validity
- × The divers were all volunteers on a diving holiday, so the setting was not controlled, it changed location each day
- × There could have been cheating underwater, as the researchers could not observe the participants (although it was assumed cheating did not happen as if it had, there would have been higher recall underwater, which there wasn't)
- × There was a longer amount of time between study and recall when the conditions were different, because they had to get in/out of the water to swap – this could have led to the lower recall produced

2.10 Displacement Theory of Forgetting

Displacement is based on the idea that the short-term memory has a limited capacity for information. **Miller** (1956) argued that the short-term memory capacity is approximately **7±2** items of information. These can be "chunked" together to increase

If the short-term memory is full and new information is registered, then some information is going to be pushed out. There are two options in this case: information can either be forgotten, or moved into the long-term memory where it is encoded and stored. The information pushed out in either way is then overwritten with this new data. The key idea is that information will be lost unless rehearsed enough to be moved into the long-term memory

There is much evidence for the theory of displacement. The **multi-store model** of memory supports the theory with primary and recency effects. A **primary effect** derives from information which is learnt first, and so is quite well-remembered, so the information is most likely moved into the long-term memory. Whereas **recency effects** come from information which is learnt last (most recently), therefore it will still be in the **rehearsal loop** of the short-term memory, and so also remembered well

The ones on the left were the items at the top of the list, and the ones on the right on the bottom. When the list is taken away from the participant and they are asked to recall as many items as they can remember, it is not uncommon to only remember those which are highlighted green (***primary effect***), as these were first taken in, and those in blue (***recency effect***), as those will still be in the short-term memory. Those shown as red from the middle will be ***forgotten***. This is because, due to primary and recency effects, information in the middle of the list is *not* so well-remembered because it has neither been processed into the long-term memory nor remains in the rehearsal loop: it is forgotten

Waugh and Norman decided to test this idea. They read to participants a list of sixteen digits. The participants are then given a number and have to state the number which proceeds the number they are given. For example, if the **probe** (digit given to the participant) is 6, the recall should be 0. However, between the probe and the final digit (the second 8), there is a time gap and more digits have been called out to the participant, making it unlikely that they will remember the recall. Primary and recency effects are displayed in this experiment:

7 0 8 4 1 6 0 9 5 5 3 7 2 4 7 8

The results of the study found what was expected: it was easier for participants to recall numbers which proceeded digits from earlier on (primary) and the most recent (recency). Those in the middle were forgotten, as the information had been lost

Waugh and Norman tested to see if it was indeed displacement, or **decay** that was causing forgetting. They did this by altering the experiment slightly. They did it again, this time with two variations. In one variation, the numbers were read **slowly** (one digit per second), and the other variation **fast** (four digits per second):

- *Displacement theory* suggests that information is lost as new information is taken in because it is replaced - therefore displacement theory would say that the speed of reading would not affect participants' recall
- *Decay theory* suggests that information is lost as the memory trace fades over time - therefore decay theory would say that when the digits are all read out more quickly, recall would improve as there is less time for the information to decay from the short-term memory

They ran each of these conditions *three times*, placing the probe in a different place along the number line each time. Both decay and displacement theories suggest that recall will improve as the probe moves closer to the final digit

What Waugh and Norman found from these variations was that there was a slight, but not very huge, improvement on recall when the digits were read out fast. This suggests that perhaps the conclusions of the original experiment were wrong, as it might have been decay causing the forgetting: but because the difference was so insignificant, this is unlikely. However, there was a clear improvement in recall when the probe was closer to the end of the number line: which both theories suggest. This supports both theories

- ✓ The theory has been tested by scientific experiments leading to cause-and-effect conclusions
- ✓ The experiments have strong controls – so the experiments are replicable and their findings are likely to be reliable
- ✓ The theory fits nicely with both the multi-store model and the working memory model, both of which are supported by evidence
- × It is difficult to operationalised the theory and measure displacement (what could be displacement might actually be decay)
- × Tasks used in the experiments to test the theory are artificial and not everyday tasks, therefore they lack validity